

## SPDT SWITCH GaAs MMIC

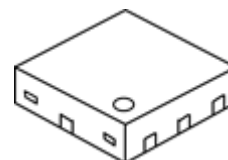
### ■ GENERAL DESCRIPTION

The NJG1801K75 is a SPDT switch IC suited for switching transmit/receive signals at 802.11 a/b/g/n/ac applications.

The NJG1801K75 features low insertion loss, high isolation, and high handling power.

This switch exhibits wide frequency coverage up to 6.0GHz. And the ultra small and ultra thin package of DFN6-75 is adopted.

### ■ PACKAGE OUTLINE



NJG1801K75

### ■ APPLICATION

802.11 a/b/g/n/ac networks applications

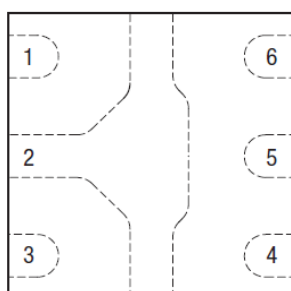
Transmit / receive switching, path switching applications

### ■ FEATURES

- Control voltage  $V_{CTL(H)}=3.0V$  typ.  
 $V_{CTL(L)}=0V$  typ.
- Low insertion loss 0.35dB typ. @f=2.4 to 2.5GHz  
0.45dB typ. @f=4.9 to 5.9GHz
- High isolation 28dB typ. @f=2.4 to 2.5GHz  
30dB typ. @f=4.9 to 5.9GHz
- P-1dB  $P_{-1dB}=31$  dBm typ. @f=2.5GHz  
 $P_{-1dB}=31$  dBm typ. @f=5.9GHz
- Ultra small & ultra thin package DFN6-75 (Package Size: 1.0x1.0x0.375mm typ.)
- RoHS compliant and Halogen Free, MSL1

### ■ PIN CONFIGURATION

(Top view)



Pin connection

1. P1
2. GND
3. P2
4. VCTL2
5. PC
6. VCTL1

### ■ TRUTH TABLE

“H”= $V_{CTL(H)}$ , “L”= $V_{CTL(L)}$

| ON PATH | VCTL1 | VCTL2 |
|---------|-------|-------|
| PC-P1   | L     | H     |
| PC-P2   | H     | L     |

NOTE: Please note that any data or drawing in this catalog is subject to change.

## ■ ABSOLUTE MAXIMUM RATINGS

$T_a=+25^{\circ}\text{C}$ ,  $Z_S=Z_I=50\ \Omega$

| PARAMETER             | SYMBOL    | CONDITIONS                                                                           | RATINGS     | UNITS              |
|-----------------------|-----------|--------------------------------------------------------------------------------------|-------------|--------------------|
| RF Input Power        | $P_{IN}$  | $V_{CTL(L)}=0\text{V}$ , $V_{CTL(H)}=3.0\text{V}$ ,<br>ON State Port                 | +31         | dBm                |
| Control Voltage       | $V_{CTL}$ |                                                                                      | 6.0         | V                  |
| Power Dissipation     | $P_D$     | 4-layer FR4 PCB<br>without through-hole<br>(76.2x114.3mm), $T_i=150^{\circ}\text{C}$ | 430         | mW                 |
| Operating Temperature | $T_{opr}$ |                                                                                      | -40 to +105 | $^{\circ}\text{C}$ |
| Storage Temperature   | $T_{stg}$ |                                                                                      | -55 to +150 | $^{\circ}\text{C}$ |

## ■ ELECTRICAL CHARACTERISTICS1 (DC CHARACTERISTICS)

(General conditions:  $V_{CTL(H)}=3.0\text{V}$ ,  $V_{CTL(L)}=0\text{V}$ ,  $T_a=+25^{\circ}\text{C}$ , with application circuit)

| PARAMETERS             | SYMBOL       | CONDITIONS | MIN  | TYP | MAX | UNITS         |
|------------------------|--------------|------------|------|-----|-----|---------------|
| Control Voltage (HIGH) | $V_{CTL(H)}$ |            | 1.8  | 3.0 | 5.0 | V             |
| Control Voltage (LOW)  | $V_{CTL(L)}$ |            | -0.2 | -   | 0.2 | V             |
| Control Current        | $I_{CTL}$    |            | -    | 5   | 10  | $\mu\text{A}$ |

## ■ ELECTRICAL CHARACTERISTICS2 (RF CHARACTERISTICS)

(General conditions:  $V_{CTL(H)}=3.0V$ ,  $V_{CTL(L)}=0V$ ,  $T_a=+25^{\circ}C$ ,  $Z_S=Z_L=50\ \Omega$ , with application circuit)

| PARAMETERS                            | SYMBOL      | CONDITIONS             | MIN | TYP  | MAX  | UNITS |
|---------------------------------------|-------------|------------------------|-----|------|------|-------|
| Insertion loss1                       | LOSS1       | f=2.4 to 2.5GHz        | -   | 0.35 | 0.55 | dB    |
| Insertion loss2                       | LOSS2       | f=4.9 to 5.9GHz        | -   | 0.45 | 0.70 | dB    |
| Isolation1                            | ISL1        | f=2.4 to 2.5GHz        | 25  | 28   | -    | dB    |
| Isolation2                            | ISL2        | f=4.9 to 5.9GHz        | 25  | 30   | -    | dB    |
| Return loss1                          | RL1         | f=2.4 to 2.5GHz        | 18  | 28   | -    | dB    |
| Return loss2                          | RL2         | f=4.9 to 5.9GHz        | 15  | 20   | -    | dB    |
| Input power at 1dB compression point1 | $P_{-1dB1}$ | f=2.4 to 2.5GHz        | 29  | 31   | -    | dBm   |
| Input power at 1dB compression point2 | $P_{-1dB2}$ | f=4.9 to 5.9GHz        | 28  | 31   | -    | dBm   |
| Switching time                        | $T_{SW}$    | 50% VCTL to 10%/90% RF | -   | 100  | 300  | ns    |

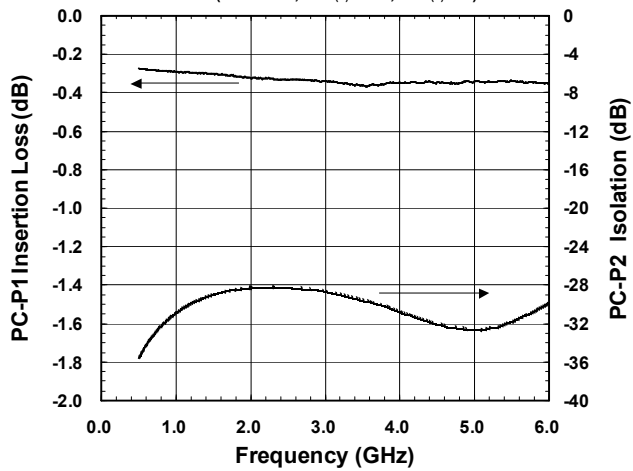
## ■ TERMINAL INFORMATION

| No. | SYMBOL | DESCRIPTION                                                                                                        |
|-----|--------|--------------------------------------------------------------------------------------------------------------------|
| 1   | P1     | RF terminal. An external DC blocking capacitor is required.                                                        |
| 2   | GND    | Ground terminal. Please connect this terminal with ground plane as close as possible for excellent RF performance. |
| 3   | P2     | RF terminal. An external DC blocking capacitor is required.                                                        |
| 4   | VCTL2  | Control voltage input terminal.                                                                                    |
| 5   | PC     | Common RF terminal. An external DC blocking capacitor is required.                                                 |
| 6   | VCTL1  | Control voltage input terminal.                                                                                    |

## ELECTRICAL CHARACTERISTICS

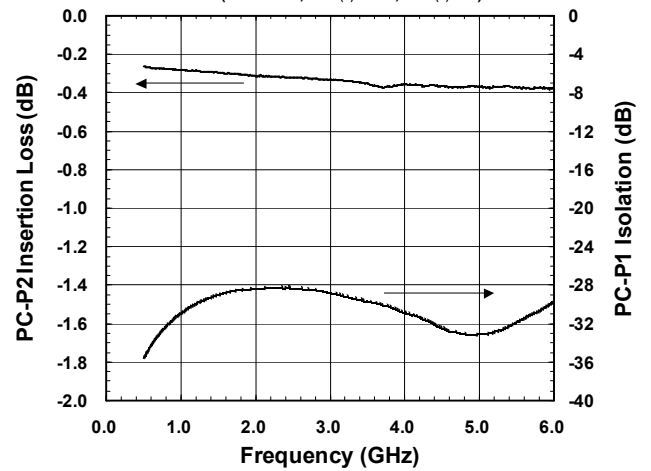
### Loss, ISL vs Frequency

(PC-P1 ON,  $V_{CTL(H)}=3.0V$ ,  $V_{CTL(L)}=0V$ )



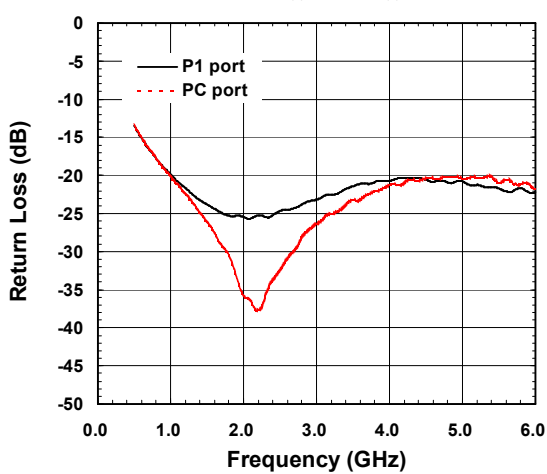
### Loss, ISL vs Frequency

(PC-P2 ON,  $V_{CTL(H)}=3.0V$ ,  $V_{CTL(L)}=0V$ )



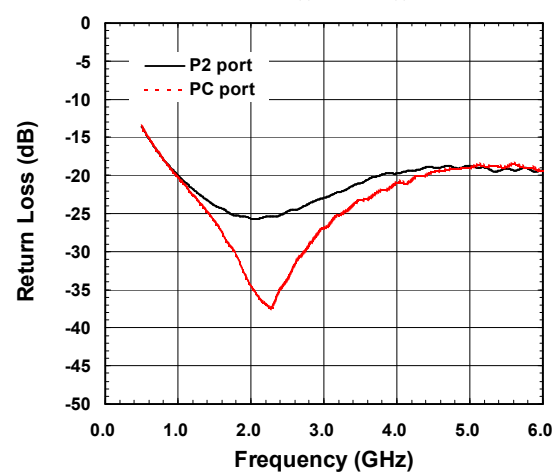
### Return Loss vs Frequency

(PC-P1 ON,  $V_{CTL(H)}=3.0V$ ,  $V_{CTL(L)}=0V$ )



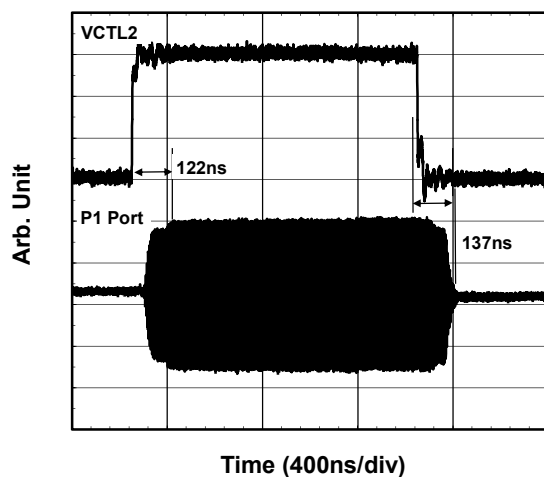
### Return Loss vs Frequency

(PC-P2 ON,  $V_{CTL(H)}=3.0V$ ,  $V_{CTL(L)}=0V$ )



### Switching Time

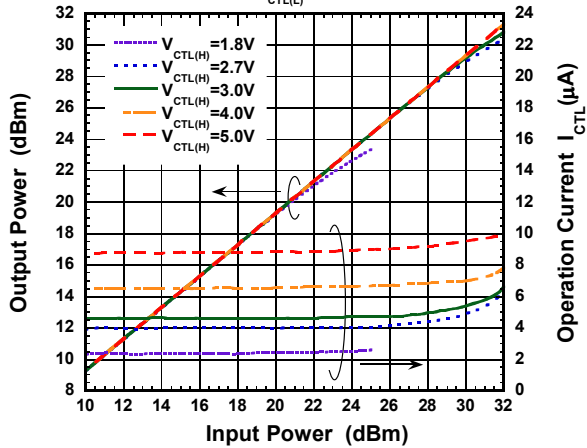
(PC-P1 Path,  $V_{CTL(H)}=3.0V$ ,  $V_{CTL(L)}=0V$ )



## ELECTRICAL CHARACTERISTICS

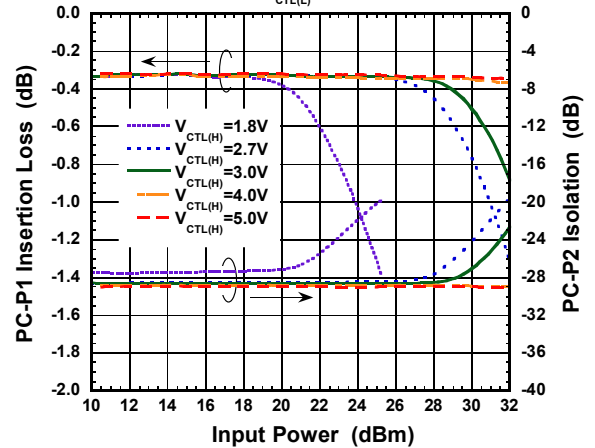
### Output Power, $I_{CTL}$ vs Input Power

(PC-P1 ON,  $V_{CTL(L)}=0V$ ,  $f=2.5GHz$ )



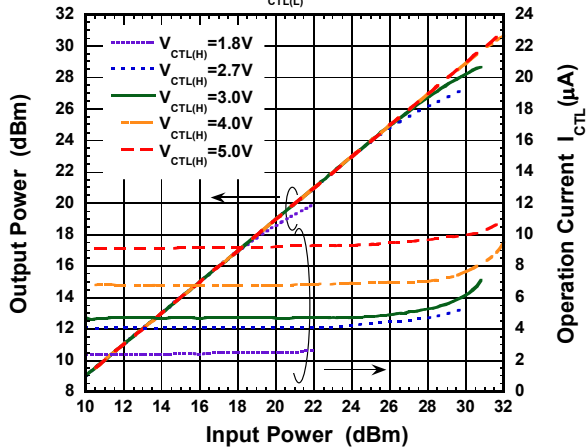
### Loss, ISL vs Input Power

(PC-P1 ON,  $V_{CTL(L)}=0V$ ,  $f=2.5GHz$ )



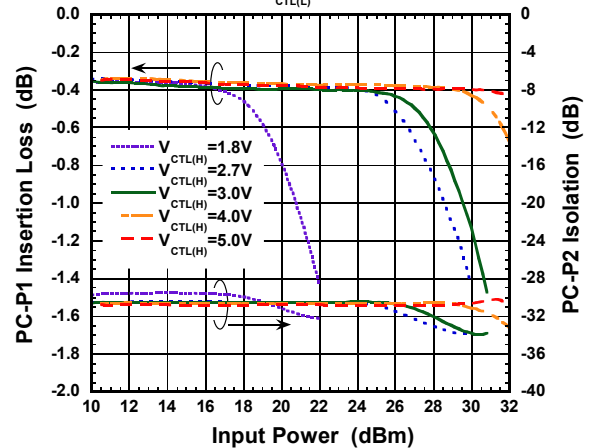
### Output Power, $I_{CTL}$ vs Input Power

(PC-P1 ON,  $V_{CTL(L)}=0V$ ,  $f=5.9GHz$ )



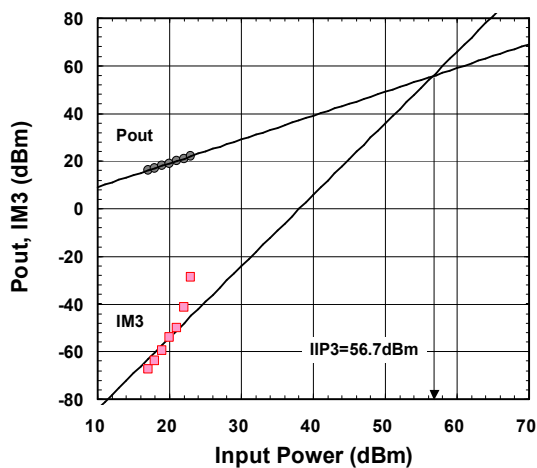
### Loss, ISL vs Input Power

(PC-P1 ON,  $V_{CTL(L)}=0V$ ,  $f=5.9GHz$ )



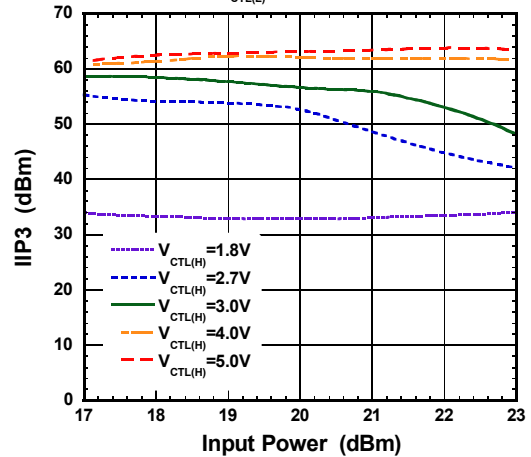
### Output Power, IM3 vs Input Power

(PC-P1 ON,  $V_{CTL(H)}=3.0V$ ,  $V_{CTL(L)}=0V$ ,  $f=2.5GHz+2.501GHz$ )

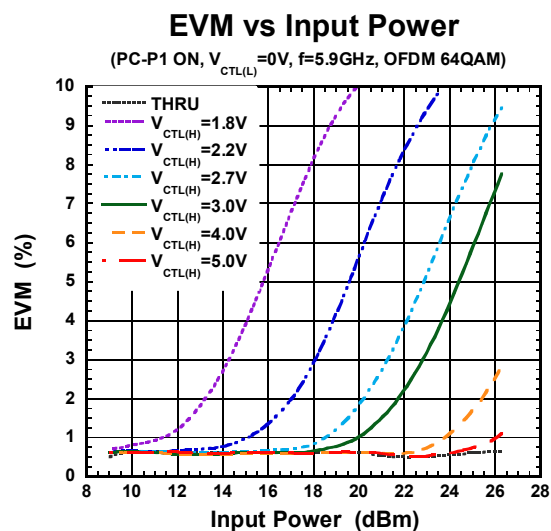
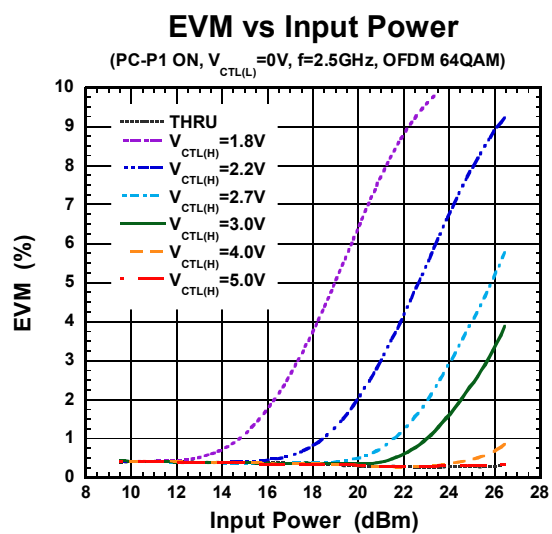


### IIP3 vs Input Power

(PC-P1 ON,  $V_{CTL(L)}=0V$ ,  $f=2.5GHz+2.501GHz$ )

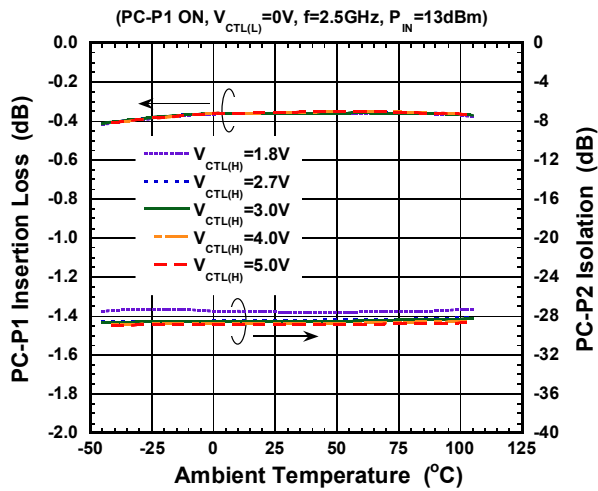


## ■ ELECTRICAL CHARACTERISTICS

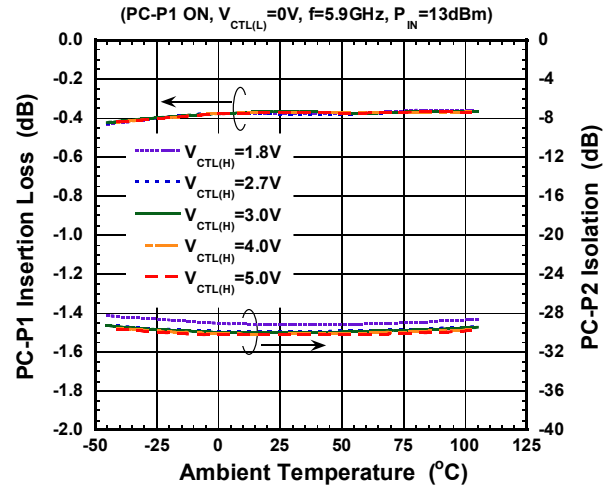


## ELECTRICAL CHARACTERISTICS

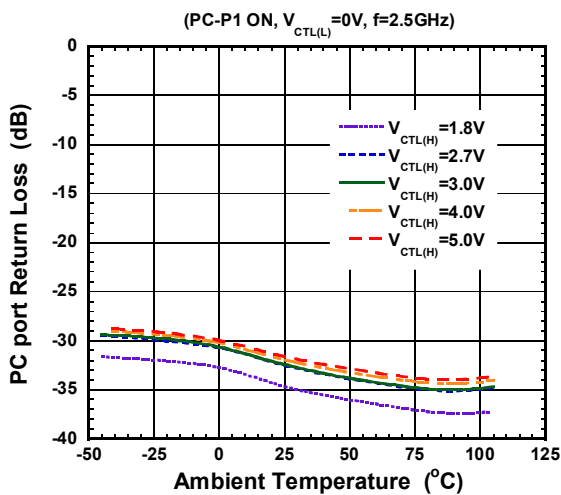
### Loss, ISL vs Temperature



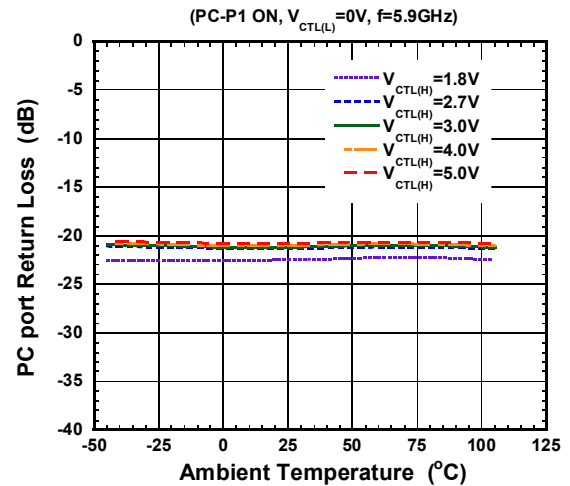
### Loss, ISL vs Temperature



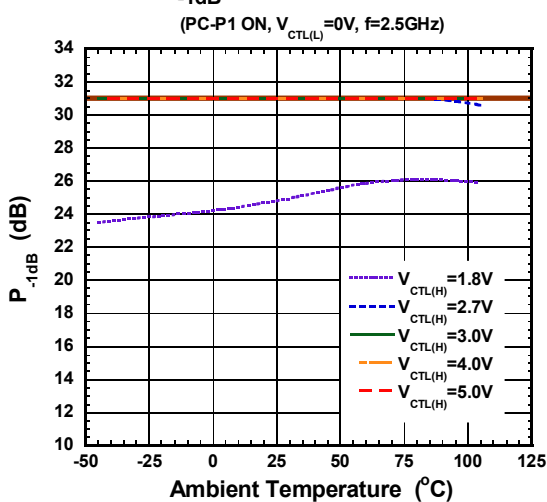
### Return Loss vs Temperature



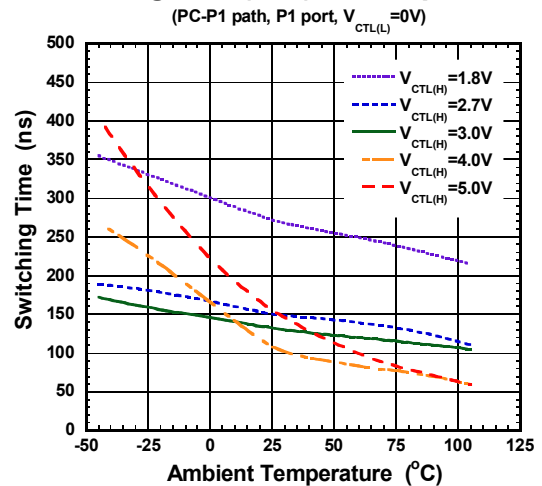
### Return Loss vs Temperature



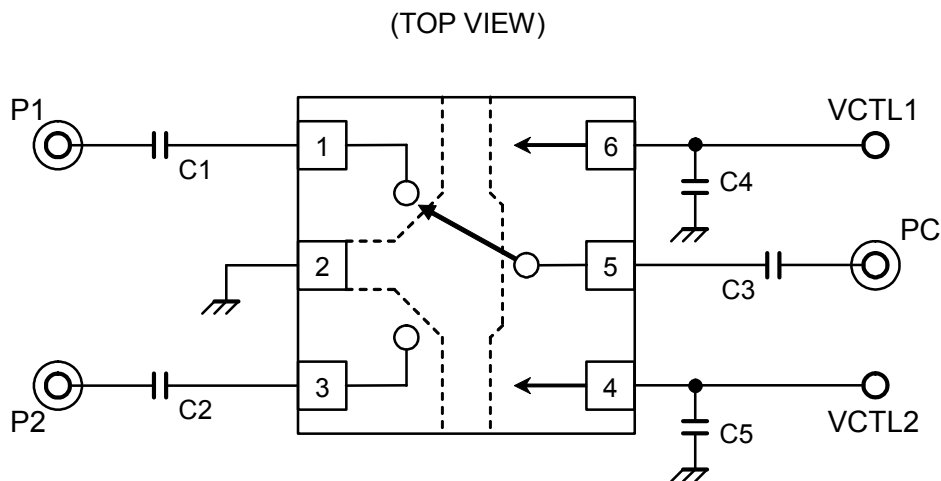
### P<sub>-1dB</sub> vs Temperature



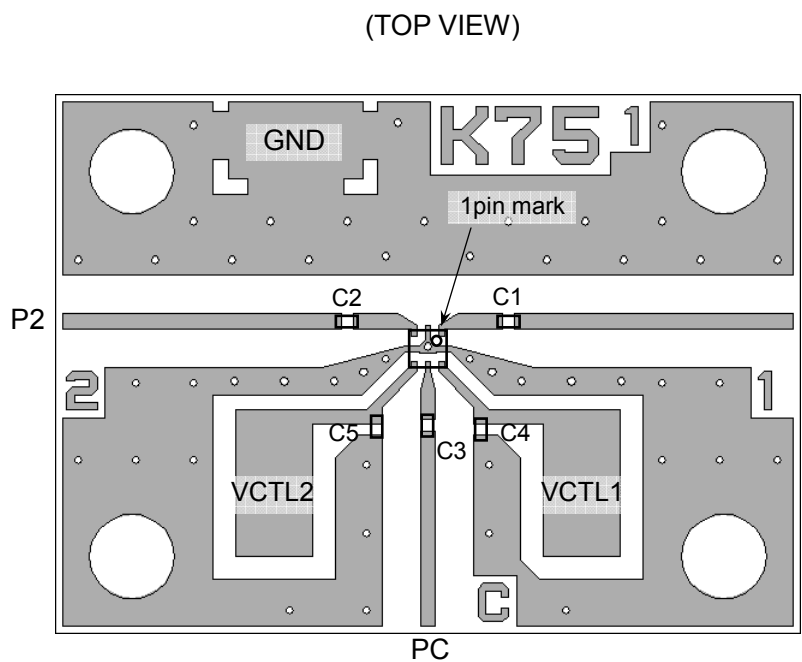
### Switching Time(rise) vs Temperature



APPLICATION CIRCUIT



RECOMMENDED PCB DESIGN



PCB: FR-4, t=0.2mm  
Capacitor Size: 0603 (0.6 x 0.3 mm)  
Strip Line Width: 0.4mm  
PCB Size: 19.4 x 14.0mm  
Through Hole Diameter: 0.2mm

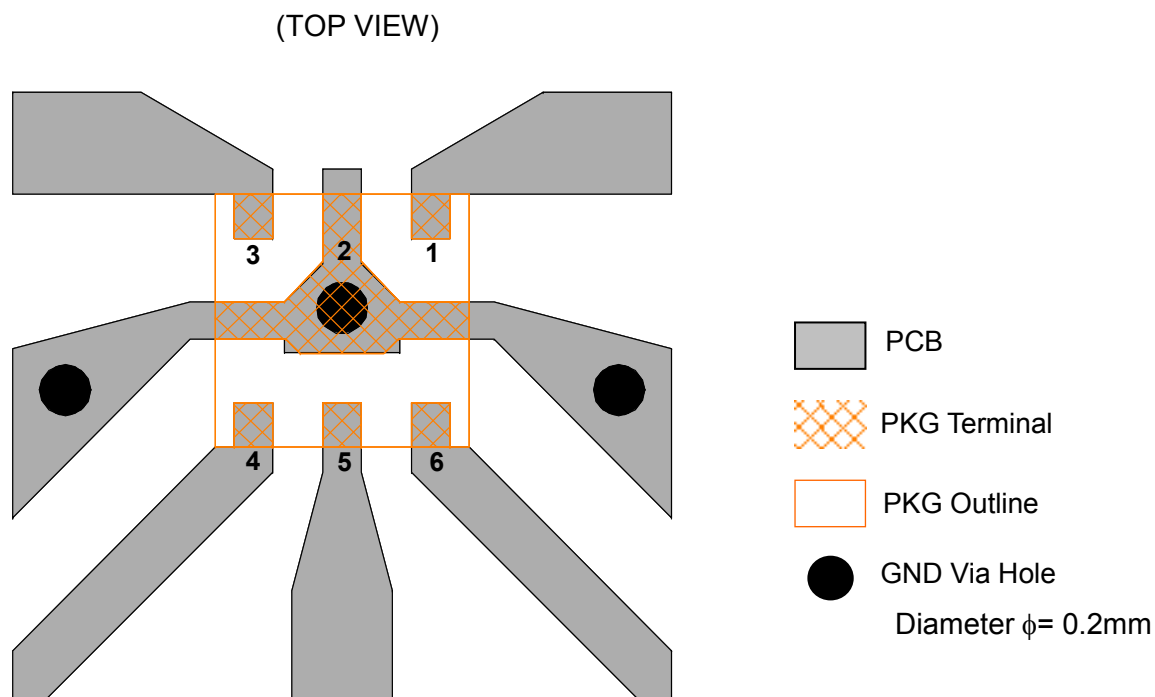
Loss of PCB, capacitor and connectors

| Frequency (GHz) | Loss (dB) |
|-----------------|-----------|
| 2.4             | 0.33      |
| 2.5             | 0.34      |
| 4.9             | 0.55      |
| 5.9             | 0.65      |

PARTS LIST

| No.      | Value | Notes                        |
|----------|-------|------------------------------|
| C1 to C3 | 27pF  | Murata MFG<br>(GRM03 series) |
| C4 to C5 | 10pF  |                              |

## ■ PCB LAYOUT GUIDELINE



## PRECAUTIONS

- [1] The DC blocking capacitors should be placed at RF terminals. Please choose appropriate capacitance value at the application frequency.
- [2] For good RF performance, exposed pad should be connected to PCB ground plane as close as possible.

## RECOMMENDED FOOTPRINT PATTERN (6pin DFN Package 1.0x1.0mm) <Reference>

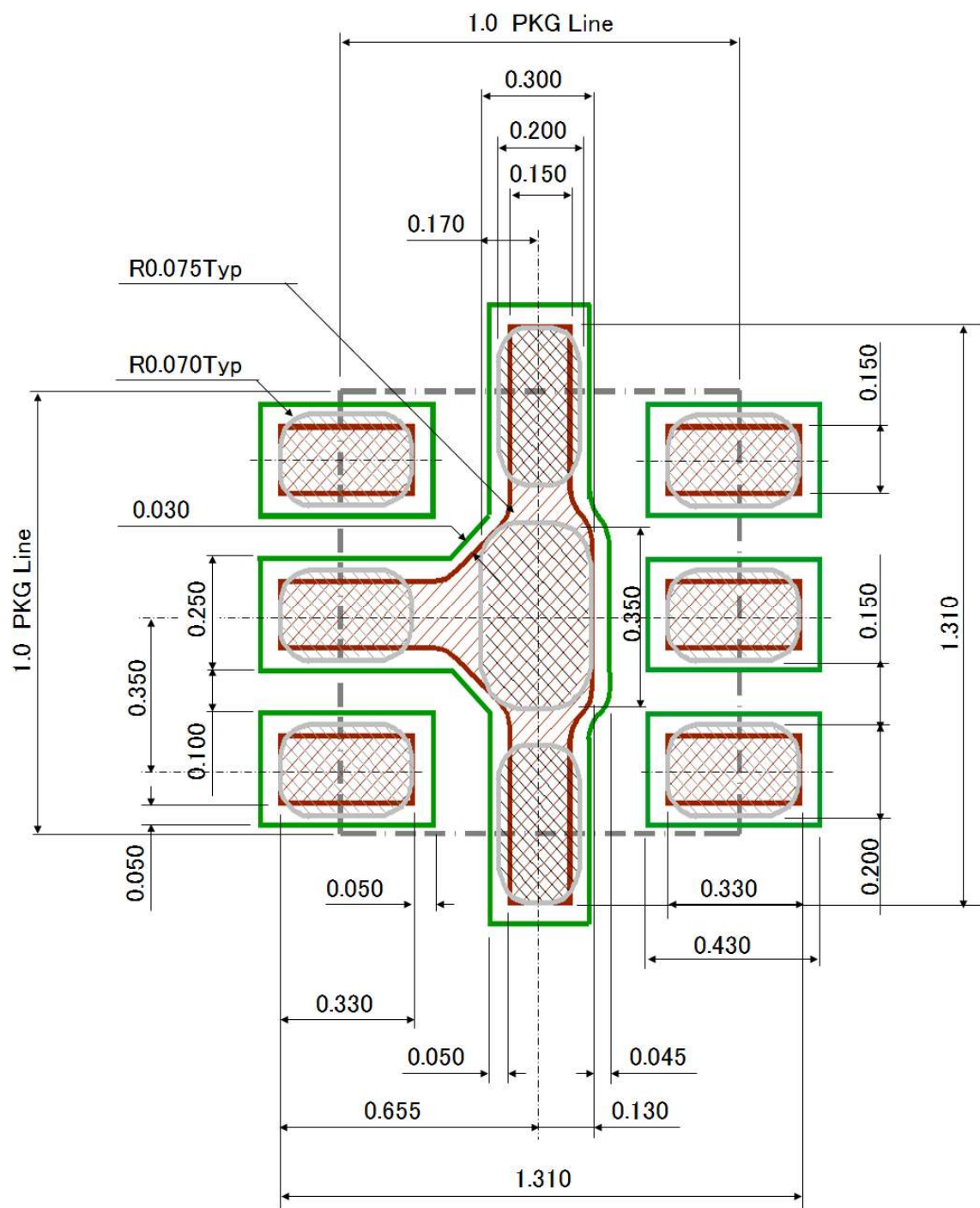
Package: 1.0mm x 1.0mm

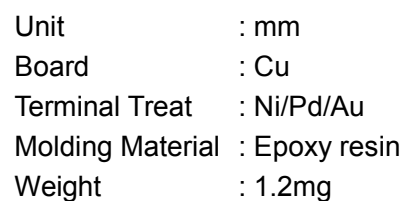
Pin pitch: 0.35mm

 : Land

 : Mask (Open area) \*Metal mask thickness: 100μm

 : Resist (Open area)





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